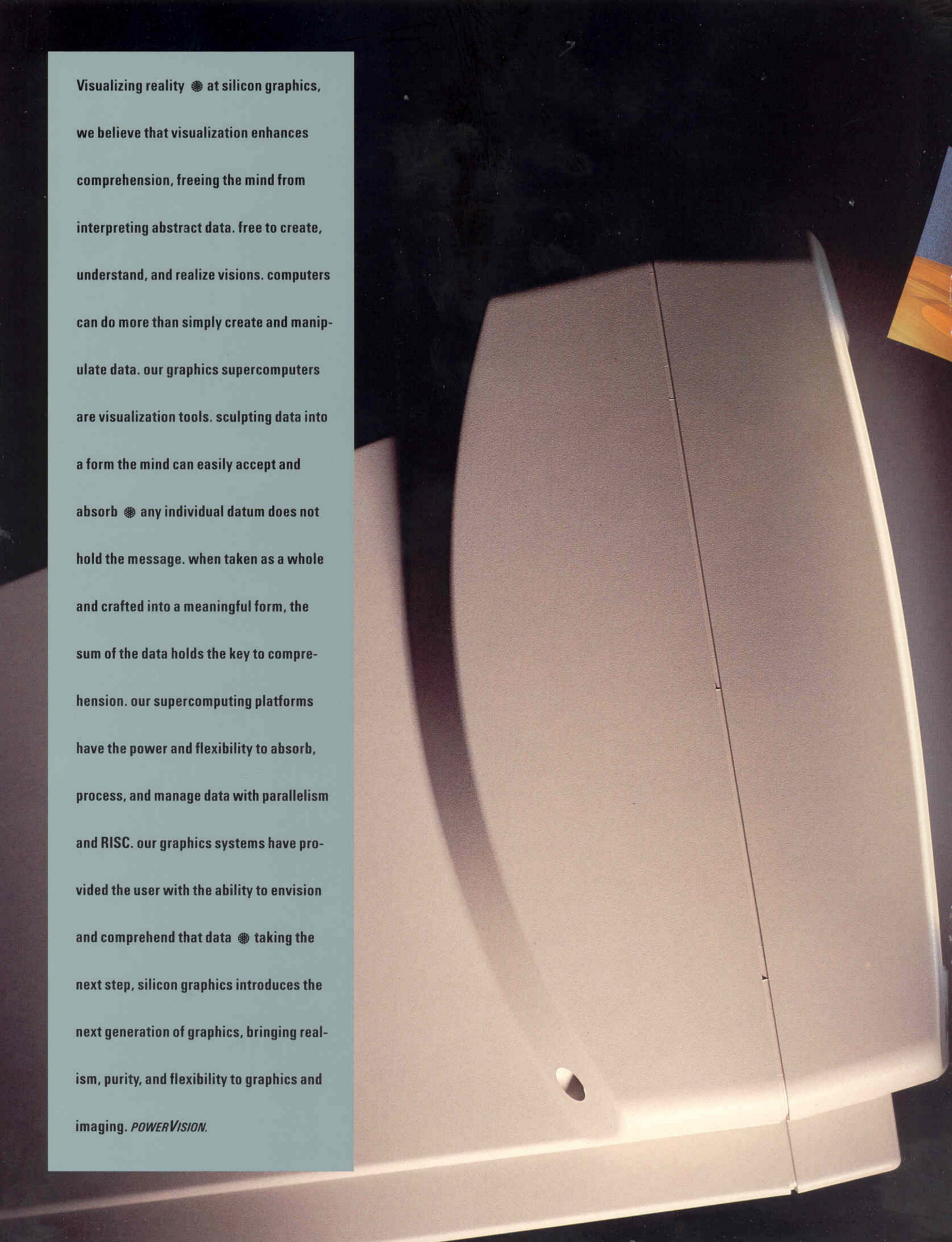
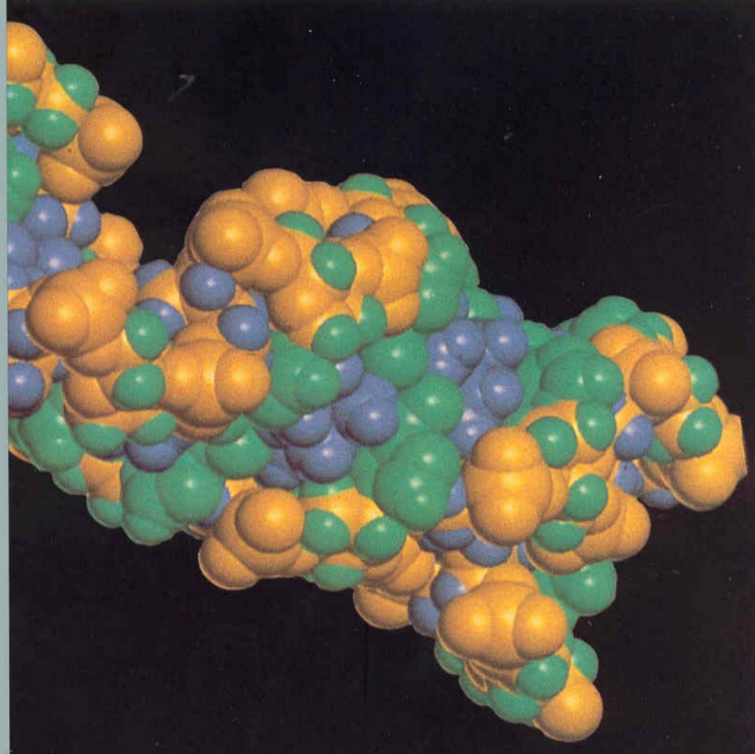
SiliconGraphics

POWER
SERIES

POWERVISION



Visualizing reality ❁ at silicon graphics, we believe that visualization enhances comprehension, freeing the mind from interpreting abstract data. free to create, understand, and realize visions. computers can do more than simply create and manipulate data. our graphics supercomputers are visualization tools. sculpting data into a form the mind can easily accept and absorb ❁ any individual datum does not hold the message. when taken as a whole and crafted into a meaningful form, the sum of the data holds the key to comprehension. our supercomputing platforms have the power and flexibility to absorb, process, and manage data with parallelism and RISC. our graphics systems have provided the user with the ability to envision and comprehend that data ❁ taking the next step, silicon graphics introduces the next generation of graphics, bringing realism, purity, and flexibility to graphics and imaging. *POWERVISION.*

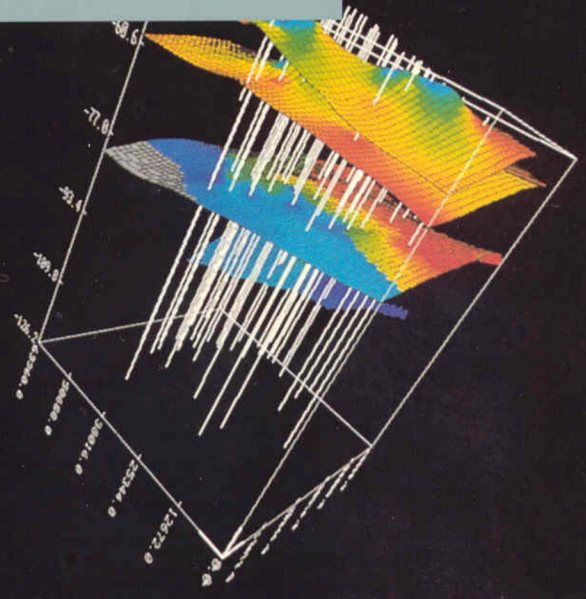


Revolutionary Architecture, Leading Edge Technology

Dynamic. Realistic. This is what *POWERVISION* is all about. IRIS *POWERVISION*™ Graphics Supercomputers set new standards, being the first to unify hardware accelerated geometric processing with high speed image processing. Graphics and Imaging, one platform.

Enabling this new capability is the IRIS *VISION*™ graphics subsystem. Based upon a new, highly parallel architecture, the graphics subsystem utilizes leading edge 1.0 micron CMOS technology. Containing up to 85 newly designed ASICs with 4.7 million gates, it extends the range of the graphics pipeline, enabling new features, and providing revolutionary graphics performance. Through microcode, the programmable graphics processors are flexible enough to grow with the system, enabling us to respond to future customer needs, adding new features and improving performance.

POWERVISION Graphics Supercomputers maintain the balance between powerful CPU and graphics subsystems, combining the POWER Series CPU subsystem with the *VISION* graphics subsystem. With CPU throughput approaching that of million dollar supercomputers and the graphics features and performance of high end Computer Image Generators (as used in flight simulators), *POWERVISION* systems provide unequaled performance to enable unlimited achievement.



Putting the POWER in POWERVISION

P*OWERVISION* systems offer CPU power from 20 MIPS and 3.3 Double Precision MFLOPS to 234 MIPS and 32.7 MFLOPS. Setting the high-end graphics standard, *POWERVISION* delivers 1M polygons per second, 1M anti-aliased RGB vectors per second, 1.5M anti-aliased RGB points per second, a DMA rate of 20M pixels per second, a polygon fill rate of up to 200M pixels per second, and a screen clear rate of up to 1.6 *billion* pixels per second. In addition to the standard graphics operations, imaging functions can be performed at up to 128 MFLOPS in the graphics pipeline. Ensuring image quality, *POWERVISION* supplies a minimum of *140 bits per pixel* with a maximum of *268 bits per pixel.* Now a picture is worth at least a *Million* words.

Envision Features that Enable

Designed to enable a broad range of graphics oriented application segments, *POWERVISION* technology provides a set of features with a level of quality and completeness unavailable on *any other platform in the industry.*

Texturing

TruTexture™ may be used to produce high quality, realistic images with tremendous flexibility. Texture patterns or images with resolutions of up to 256x256 pixels and depths of 8 to 32 bits per pixel can be applied to polygons, vectors, *and* points. Textures of up to 32Kx32K are also possible via multi-pass techniques. Texture memory is managed by the system to allow a virtually unlimited number of textures. Textures are applied correctly even when they are slightly smaller or greater than a single pixel. Perspective correction is performed to prevent textures from "swimming" as objects move. Aliasing is minimized by filtering the texture for each pixel textured. This filtering is accomplished by using Mip Mapping techniques. The flexible architecture allows textures to be applied in a variety of ways, either repeating across a surface, on a portion of a surface, alpha blended with obscured surfaces, stamped into the scene, or decaled. Texture blending is performed using user selected criteria, including point sampling, linear interpolation, and bilinear Mip Map interpolation.

Sub-pixel Positioning

MicroPixel™ allows all vertices to retain their fractional positioning information rather than being coerced to integer values, maintaining an accurate description of each primitive's position. Pixels are shaded at a virtual resolution of 10K x 8K. Without this feature, objects would render and blend incorrectly and jitter as they move.

Anti-Aliasing

Anti-aliasing is available for *all* system primitives, including polygons, vectors, and points. Proprietary algorithms enable polygon anti-aliasing, with proper edge blending and fade in silhouette. Sub-pixel positioning is used at all times, and endpoint correction for vectors eliminates popping artifacts.

Accumulation Buffer

The *SharpScene*™ accumulation buffer is used to combine or accumulate a set of images together. This feature enables full scene anti-aliasing by combining a set of images, identical except for sub-pixel offsets. Similar methods enable such special effects as motion blur, depth of field simulation, and soft shadows. For Image Processing, convolution filters can be interactively applied to images stored in the frame buffer.

Imaging Library

POWERVISION systems all include the *IMAGEVISION LIBRARY*, a set of fundamental data manipulation functions enabling such operations as FFTs and warps directly in the graphics pipeline. The *IMAGEVISION LIBRARY* routines manage the configuration of the front end graphics processors, move values to and from user memory, and provide arithmetic functions.

Fog

Fog and Haze weather effects are obtainable by blending a fog color with user specified density on a per-vertex basis. These attenuation effects work with fully textured and anti-aliased polygons and can be used for depth cueing.

Lighting

New lighting features include directional spotlights with user specified concentrations and two-sided lighting to enable the setting of different surface properties for each side of a polygon and thus the lighting of both sides.

Stereo

Each system shipped with a stereo capable monitor may be upgraded for stereo viewing via an inexpensive option with the stereo LCD shutter glasses and LED emitter.

Stenciling

Enabling conditional pixel writes and copies in the frame buffer, stenciling forms the foundation for performing Constructive Solid Geometry and priority ordering operations in the frame buffer.

Evolutionary System Design

Since *POWERVISION* systems are members of the POWER Series™ family, complete software compatibility is maintained, protecting current investments and assuring upgradability. Upgrades are available to provide users with an upgrade path from the Omni IRIS 4D/85GT to the top of the Silicon Graphics product line. *POWERVISION* systems also utilize the same

GL (Graphics Library™) as the rest of Silicon Graphics' product family, although extensions have been made to enable users to access new features which require the *VISION* graphics subsystem hardware.

POWERVISION systems utilize custom, programmable graphics processors arranged in a pipeline with a set of major subsystems for processing Geometry, Scan Conversion, Raster Operations, and Image Display.

The Geometry subsystem transforms, lights, and clips incoming vertices, eventually transforming the data from 3D model space to 2D screen coordinates. After being handed to the Scan Conversion subsystem, the 2D screen data is transformed into sets of vertical pixel *spans.*

The spans are then handed asynchronously across the pixel bus to the Raster subsystem, where custom Span Processors iterate across each span to generate the individual pixels to be displayed. The Raster subsystem is expandable such that multiple Raster subsystem boards may be added to add more texture memory, add frame buffer memory, and add features like contouring and the accumulation buffer.

Finally, the Display subsystem converts the digital frame buffer data to analog signals for display. While the system supports NTSC and PAL output directly, various video options are available for broadcast quality NTSC, Super-VHS, and PAL output, Genlock, Real-time video capture, VTR deck control, and support for digital video.

5 Boards OUT, 4 Boards IN

Silicon Graphics' commitment to 100% binary compatibility across the product line means that as an existing customer, you may upgrade to *POWERVISION* and retain your existing investment. Programs that are run without modification will obtain significantly increased performance while those modified to take advantage of new features will benefit from an incomparable new level of realism.

Customization Options

Due to the extensibility of the *VISION* graphics architecture, a variety of options may be added either at the factory or in the field. These options include a frame buffer extended feature option, adding more texture memory, over and underlay planes, and enabling 32-bit double buffered RGBA true color with transparency; an additional frame buffer card for even more texture memory and an additional 128 bit planes for features like the accumulation buffer; a video option to take the standard NTSC and PAL output and make it broadcast quality and add Super-VHS and Genlock; and finally, the Stereo option for stereoscopic viewing of 3D models, adding a pair of LCD shutter glasses and the LED emitter required to synchronize the glasses to the stereo frame rate of the monitor.

Communication Options that Integrate *POWERVISION* into Your Networks

To help you get even *more* compute and graphics power out of *POWERVISION* systems, we offer a variety of networking and software development tools. Ethernet TCP/IP is standard, while other, optional, networking products include support

for DECnet,™ IBM 5080/3270 emulation, and Hyperchannel™ interfaces to Cray computers.

Optional optimizing compilers are available for such major languages as C, FORTRAN 77, Pascal, Ada and PL/I. The available parallelizing FORTRAN compiler generates code which checks the system at runtime to determine the number of CPUs, then executes the program on as many as are available.

As part of *POWERVISION*, you receive the IRIS Graphics Library,™ the IRIS edge graphical debugger, AT&T's UNIX System V with Berkeley BSD 4.3 extensions.

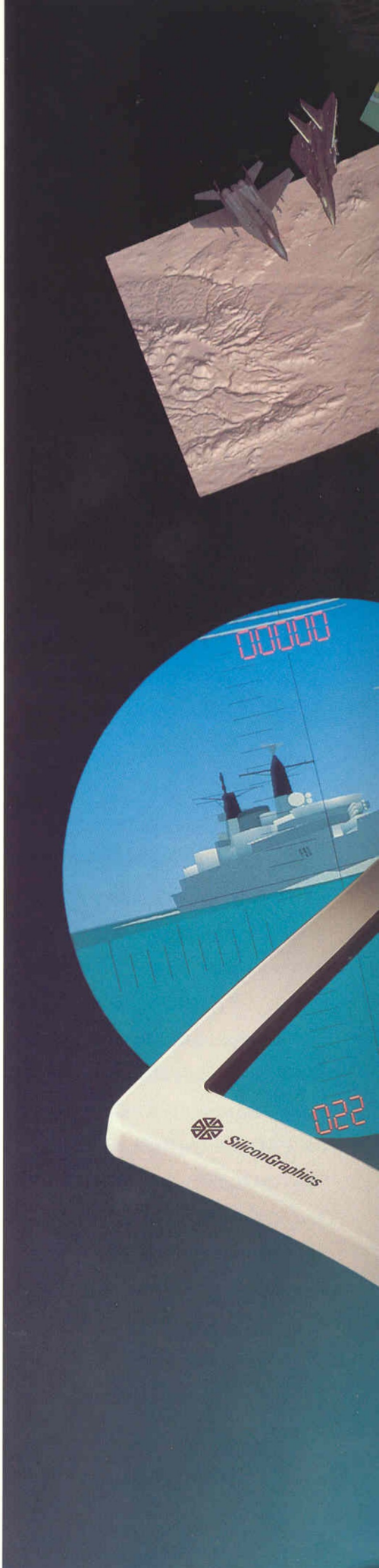
Tap into the World's Largest 3D Software Library

Through our Third Party Geometry Partners Program, we provide more than 400 software packages specifically written for 3D applications. More than 150 software developers from around the world support these comprehensive packages which cover the entire spectrum of application segments.

The Driving Force behind the Technology

The *POWERVISION* system as a whole was developed as an enabling technology for a broad range of applications, from Visual Simulation and Molecular Modeling to Image Processing, Scientific Visualization, and Creative Graphics. Features have been targeted towards each of these markets and provide the basis for movement in new and powerful directions.

VISUAL SIMULATION



"**H**ornet, hard left, bogey left seven o'clock, one mile." "Tally, Hornet's engaged" "Dragons free, bogey's staying with you, let's set counterflow." "Roger, counter... I'm pitching back, two in sight." "Roger, bogey's in trail." "Tally visual, fox two."

When you run Out-The-Window (OTW) simulations on a *POWERVISION* Graphics Supercomputer, you're running with photorealism that will make you *believe.* Tightly coupled CPU and Graphics subsystems combine to provide the horsepower you need to run complex simulations *and* generate realistic imagery in real-time.

Building extensive parallelism into both the CPU and Graphics subsystems, Silicon Graphics is delivering performance and features previously found only in Computer Image Generators costing at *least* an order of magnitude more and requiring custom-built rooms, cooling systems, and heavy duty electrical systems.

POWERVISION delivers 1M polygons per second, 1M anti-aliased vectors per second, and CPU power to 234 MIPS and 32.7 Double Precision MFLOPS. All this can be accomplished by your tableside, with no special cooling, power, or maintenance requirements.

P*OWERVISION* Graphics Supercomputers are the first off-the-shelf systems capable of true Out-The-Window simulations. Fog and haze obscuration features enable a variety of weather effects, while *TruTexture*™ enables the use of either photo-derived or procedural texture maps. Textures are applied utilizing a variety of proprietary algorithms to ensure perspective correction, filtering, and proper blending of both color and transparency. Anti-aliasing is available for all graphics primitives, including polygons, vectors, and points. *MicroPixel*™ sub-pixel positioning guarantees proper placement and eliminates crawling artifacts. Runway and shore lights are flicker free; profiled mountains and objects remain smooth.

P*OWERVISION*'s graphics performance has been amplified across the board. Pixel fill rates *start* at 100 million pixels per second. With

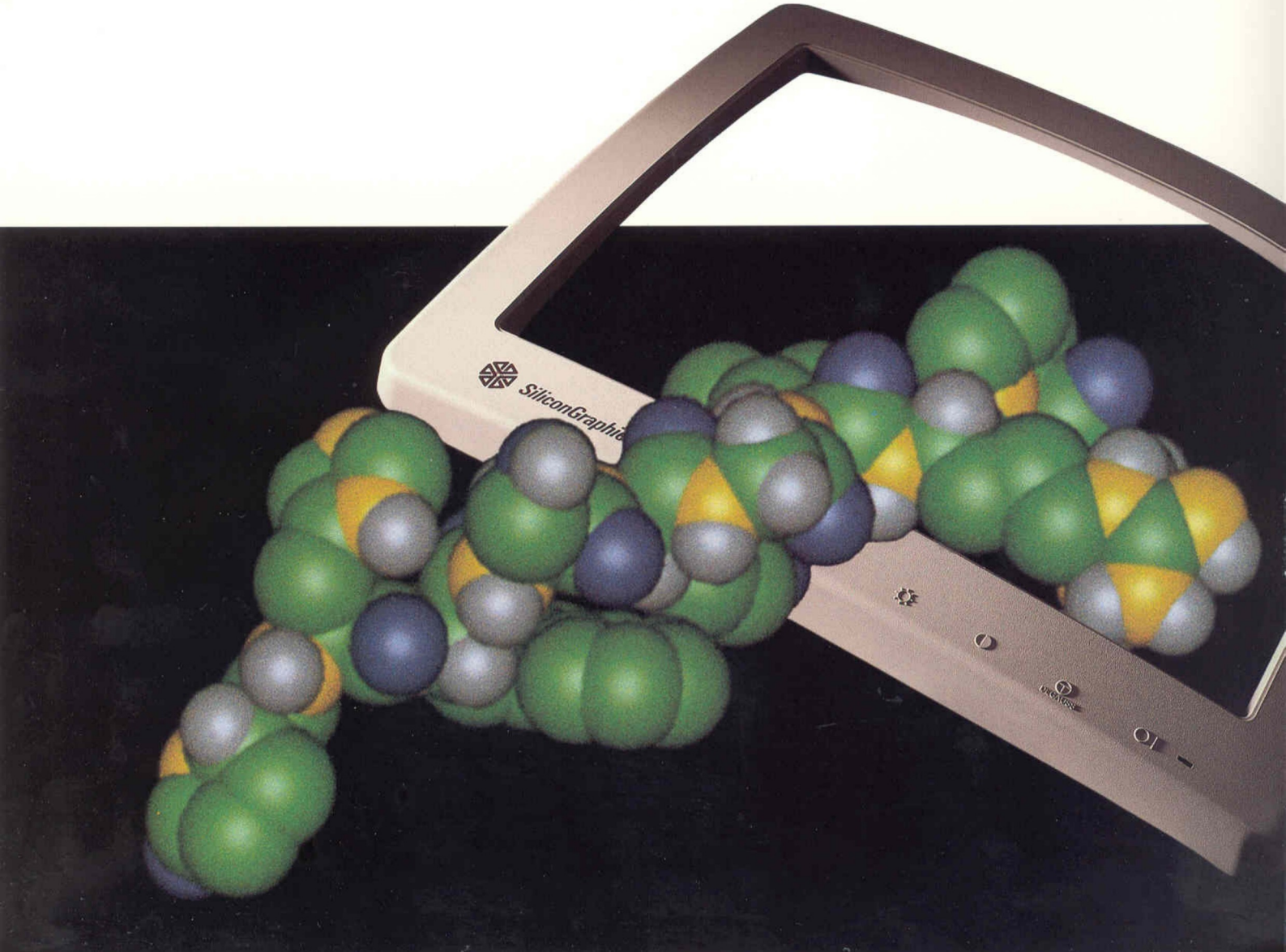
the addition of the expanded frame buffer option, this can be doubled to 200 million pixels per second to eliminate bottlenecks and maintain frame rates. Screen clear rates have been accelerated to more than 1.6 *billion* pixels per second. A variety of options offer extended frame buffer and texture memory, stereoscopic viewing, programmable video formats, and support for RS-343.

But graphics isn't the whole story. *POWERVISION* systems can run the Out-The-Window visuals, the flight models, *and* the simulation management tasks. With proprietary real-time and parallel extensions to the UNIX® operating system, the IRIX™ operating system supports a powerful set of features for time-critical applications. The IRIX kernel is preemptable, which means that the system will respond to a high priority interrupt in a determinate amount of time. Add the wide range of high-speed networking options, and dozens of third party software packages, and *POWERVISION* emerges as *the* platform for real-time simulations.

Building upon a solid track record of performance in Mission Planning, Mission Rehearsal, C^3I, Cockpit Prototyping, and low cost surface, maritime, and flight simulators, Silicon Graphics provides a single family of computers for all your simulation *and* prototyping needs. Capitalizing on *POWERVISION*'s software compatibility with the entire Silicon Graphics product line, high end Out-The-Window simulations can be run on *POWERVISION* systems while low end cockpit prototyping can be handled by other, lower cost systems in Silicon Graphics product family.

Envision an enabling technology for Visual Simulation today with an architecture that plans for tomorrow. *POWERVISION*.

COMPUTER AIDED MOLECULAR DESIGN



Pushing back the limits. That is what Silicon Graphics technology is all about. By listening to our customers we are developing machines that are focused on their needs. Your needs. Whether your specialization is in drug design and refinement or polymer chemistry and material science, we share your vision for Computer Aided Molecular Design (CAMD). With a wealth of new features and performance targeted at CAMD, *POWERVISION* pushes the limits of technology to provide for the maximum in capability and interactivity.

P*OWERVISION* systems are based upon the highly evolved *VISION* graphics subsystem. Utilizing proprietary programmable custom VLSI 1.0 micron semiconductor processors, this system can process geometric *and* image data as it flows through the graphics pipeline. Incorporating feedback from our CAMD customers and third party software vendors, the microcode was developed to handle certain features with exceptional speed and precision. *POWERVISION* has been optimized for the display of complex surface and vector representations, with performance reaching 1 million polygons per second, 1 million RGB anti-aliased vectors per second, *and* 1.5 million RGB anti-aliased points per second. Features targeted at CAMD include up to 8 double buffered over/underlay planes, direct hardware support for stereoscopic viewing, and a high performance sphere primitive.

Performance without quality would be of little benefit, and therefore a great deal of attention was paid to the *process* of anti-aliasing. Sub-pixel positioning has been used on all objects to assure the greatest accuracy and minimize any artifacts during object motion.

The performance offered by *POWERVISION* enables the ability to interactively design and refine molecules which were previously considered impractically large or complex. Interactivity is the key to effective, efficient investigations and design efforts.

In recognition of the importance of retaining *existing* investments, *POWERVISION* has been developed to be 100% binary compatible with the entire Silicon Graphics product line. Product line compatibility offers solutions across your organization with computers from the Personal IRIS™ all the way up to the top end of the POWER Series. From 234 MIPS in the CPU to 1M Anti-Aliased Vectors in the graphics subsystem, there are simply no other choices in CAMD.

POWERVISION

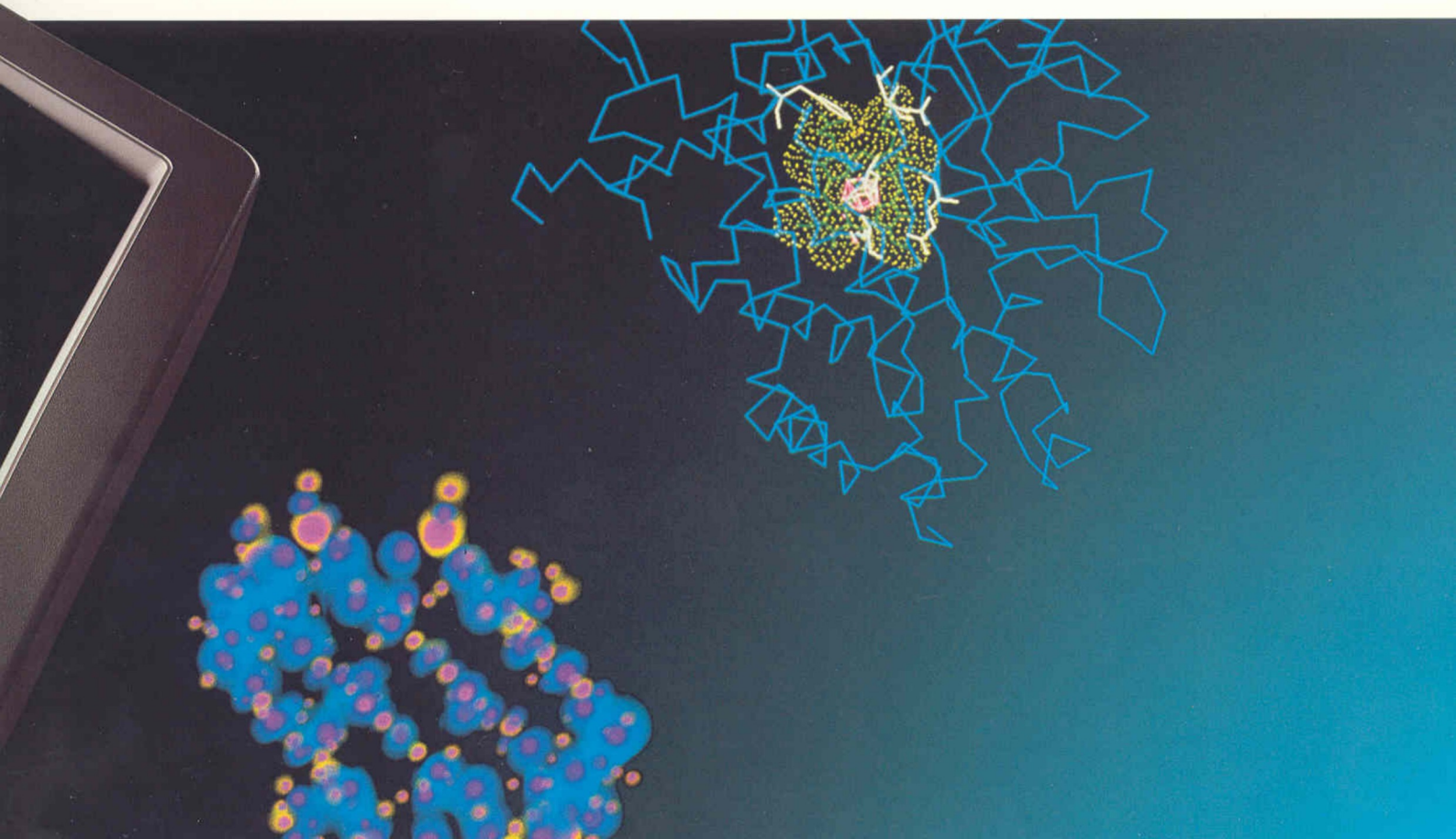


IMAGE PROCESSING

MEDICAL IMAGING

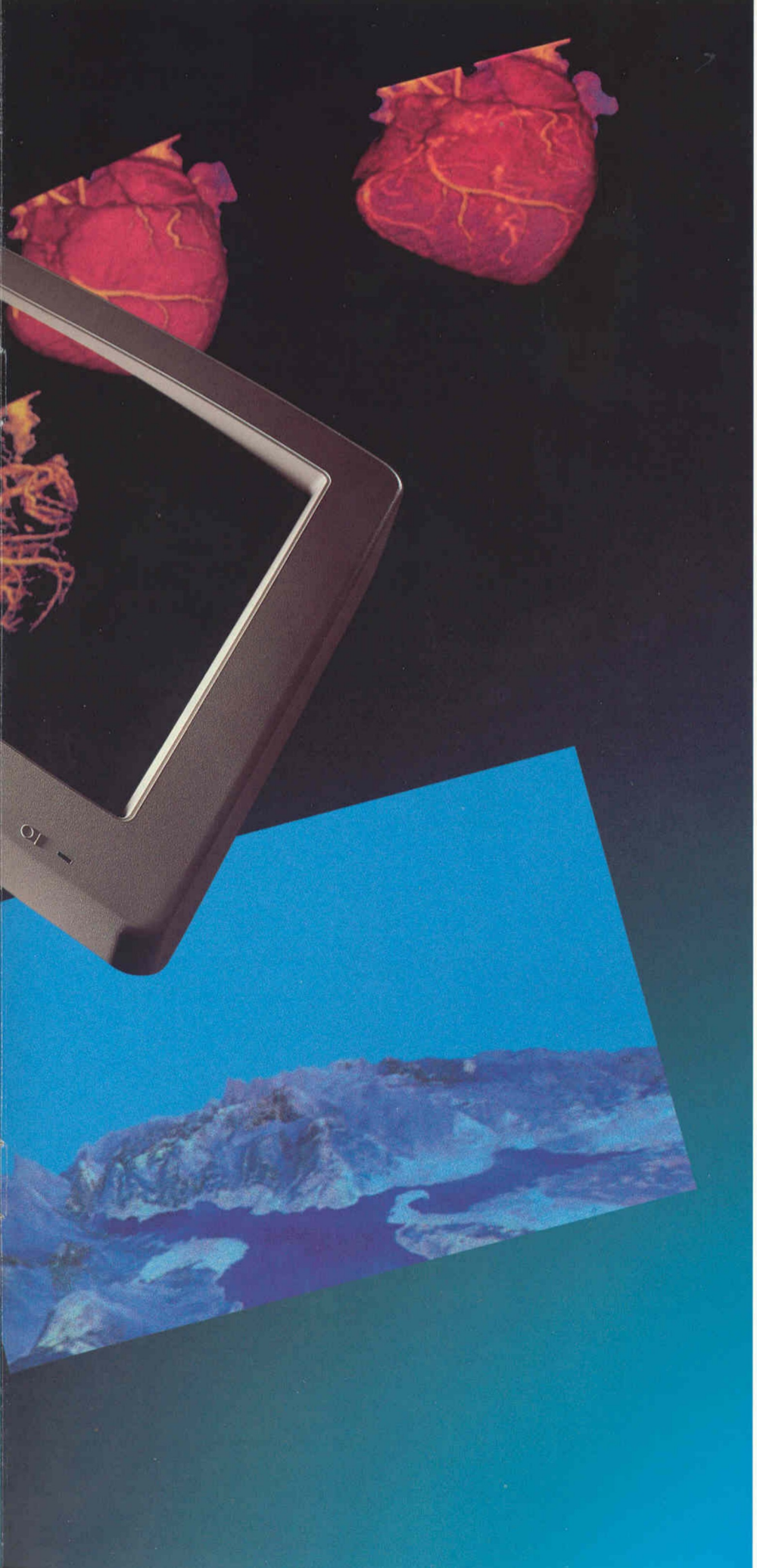
Images or volumes, pixels or voxels, *POWERVISION* accelerates processing and analysis.

Whether you're analyzing CT diagnostic image sequences of the heart or the effects of slash-and-burn agriculture from satellite images of the Amazon Basin, *POWERVISION* Graphics Supercomputers provide an effective, interactive solution for image and volumetric processing. Balancing a powerful parallel RISC CPU subsystem and the comparably parallel and powerful graphics subsystem, *POWERVISION* systems are stand-alone imaging powerhouses. Unlike other graphics systems, *POWERVISION* Graphics Supercomputers provide a single platform solution for computation, data acquisition, graphics, image and volumetric processing. A single vendor solution for maximum ease in configuration and support.

Features that Perform

P*OWERVISION* systems are equipped with a standard library of functions forming the foundation of Imaging and Volumetric processing. The *IMAGEVISION LIBRARY* enables the performance of such imaging functions as Fast Fourier Transforms (FFTs), image rotations, warps, and convolutions directly in the graphics pipeline at speeds of up to 128 MFLOPS. The pixel DMA bandwidth has been boosted to 20 million pixels per second, allowing interactive movement around images such as satellite photographs or radiographs with resolutions greater than that of the screen. This translates into real-time, interactive analysis, optimizing information flow and spurring analytical insight.

By using our proprietary, custom VLSI programmable graphics engines as specialized compute engines, real-time imaging on a standard graphics system becomes not simply feasible, but highly desirable. Throughout the *VISION* graphics subsystem, programmable parallel processors enable a broad range of imaging functions and performance features.



Flexible Imaging Architecture

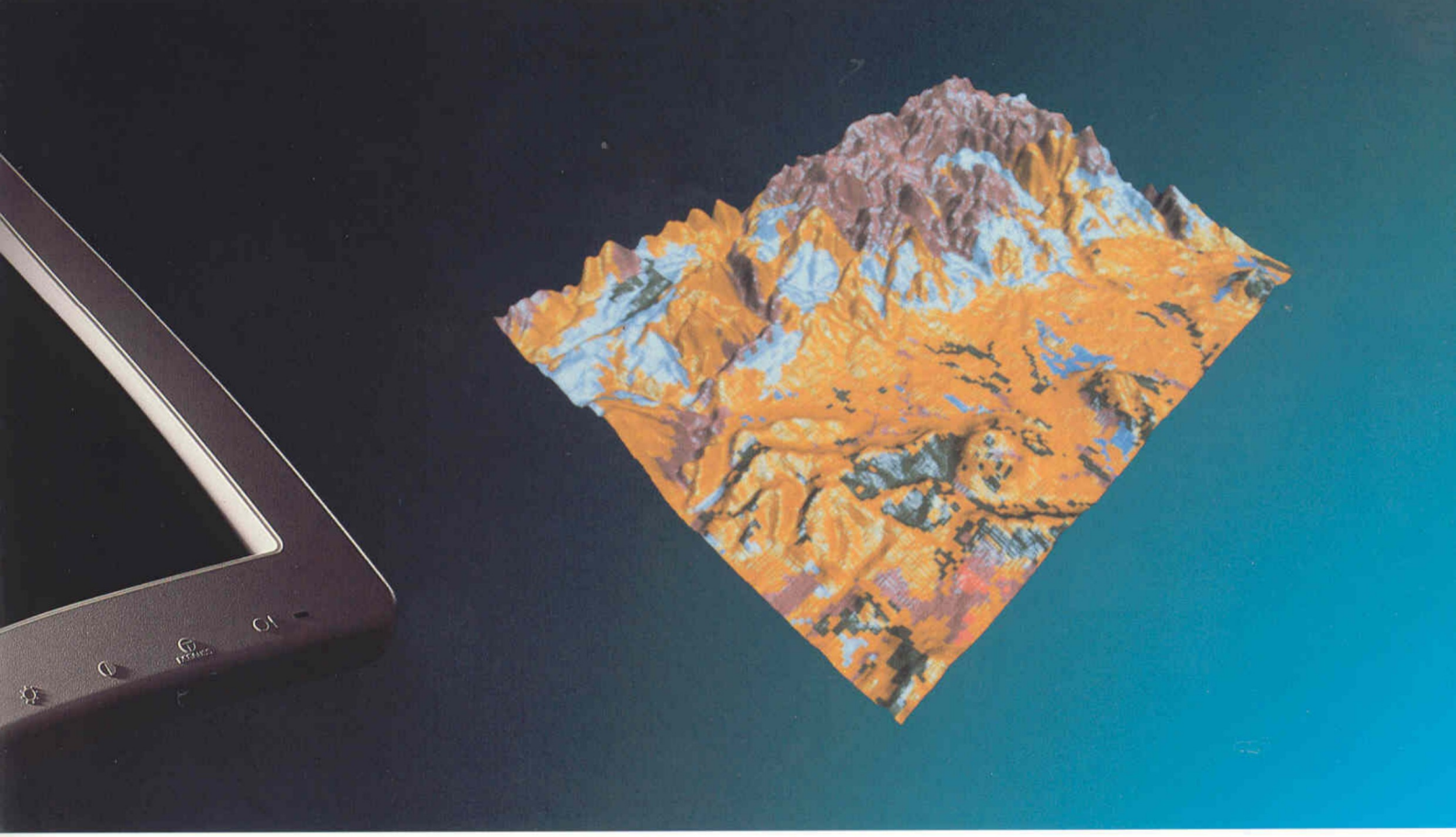
While the geometry subsystem may be used to move and manipulate image data, the RISC CPU subsystem, using the high performance MIPS R3000 processors, is itself exceptionally deft at executing image processing algorithms. Thus, you can perform image or volumetric processing in both the CPU and the graphics pipeline *simultaneously*. Breaking down the barriers between image and geometric processing, images can be textured onto surfaces and warped over geometric models. The same processors which apply image textures to geometry may be used to perform convolutions on image data in the frame buffer.

Video

A full range of video options are available covering both video input and output. From 30Hz frame capture to broadcast quality video output for NTSC, PAL, and Super-VHS, *POWERVISION* provides easy image capture, manipulation, and output.

We asked our customers what they wanted in an image processing system. *POWERVISION*. We listened.

SCIENTIFIC VISUALIZATION

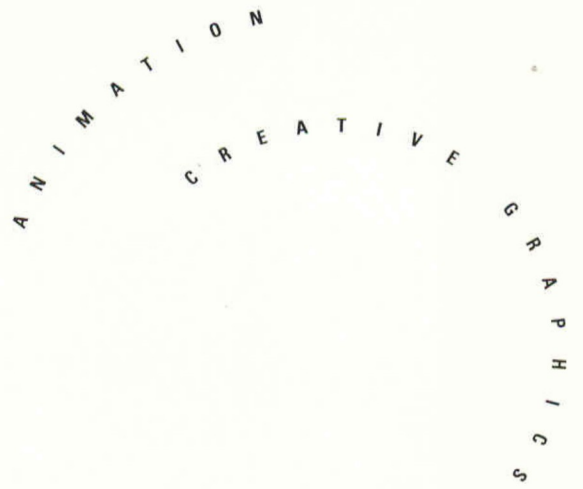


Building upon its heritage as the platform of choice for scientific visualization, Silicon Graphics refuses to rest on its laurels. With *POWERVISION*, scientists have the most powerful graphics supercomputer available to push the limits of three dimensional, interactive visualization. Whether computing the flow fields around a new airframe, studying galactic formation, analyzing satellite multi-spectral imagery, or performing three dimensional seismic or topographic studies, the requirements are the same; powerful compute power combined with realistic interactive graphics. *POWERVISION* Graphics Supercomputers fit the bill.

Combine the most advanced parallel RISC CPU subsystem providing up to 234 MIPS and 32.7 Double Precision MFLOPS with leading edge parallel graphics technology and you get a machine that is unparalleled for scientific computing. Dedicated graphics floating point hardware ensures full-speed rendering independent of CPU activity, while separate RISC floating point processors support each of the parallel CPUs. The latest custom VLSI technology is used to provide graphics performance of 1M polygons, 1M 3D vectors, 1.5M points, and 200M pixels per second and enabling true interactive visualization of complex model simulations and analyses. Supercomputer computational power has finally found its match with the super graphics power in *POWERVISION*.

Standard VME slots provide room for expansion with third party data acquisition or other boards, while graphics expansion slots make room to add graphics power and features as requirements grow. Combining unequaled polygon, vector, and point drawing speeds, with such advanced visualization techniques as image filtering, texture mapping, image processing, and contouring, *POWERVISION* frees you to spend your time performing analyses and interpretation of your data, rather than massaging or playing with it.

No longer mere front end visualization tools for supercomputers, Silicon Graphics systems stand on their own as complete scientific computing platforms. Complete binary compatibility enables the combination of *POWERVISION* systems with other members of Silicon Graphics product family for balanced workgroup solutions. Paving the way to a better understanding of scientific and natural phenomena, *POWERVISION* serves as a tool to assist scientists in utilizing their intuitive and cognitive skills.



Take a seat at *POWERVISION*. Start it up. You're about to change the way you mold your visions into reality.

Visualize your production; now create it and preview it, in **hardware**. Interactively. Apply *TruTexture*™ for fast photorealism. Craft a polished mahogany desk so real you can smell the polish. Chandeliers glittering with brass and lights. A wide, winding staircase leading nowhere.

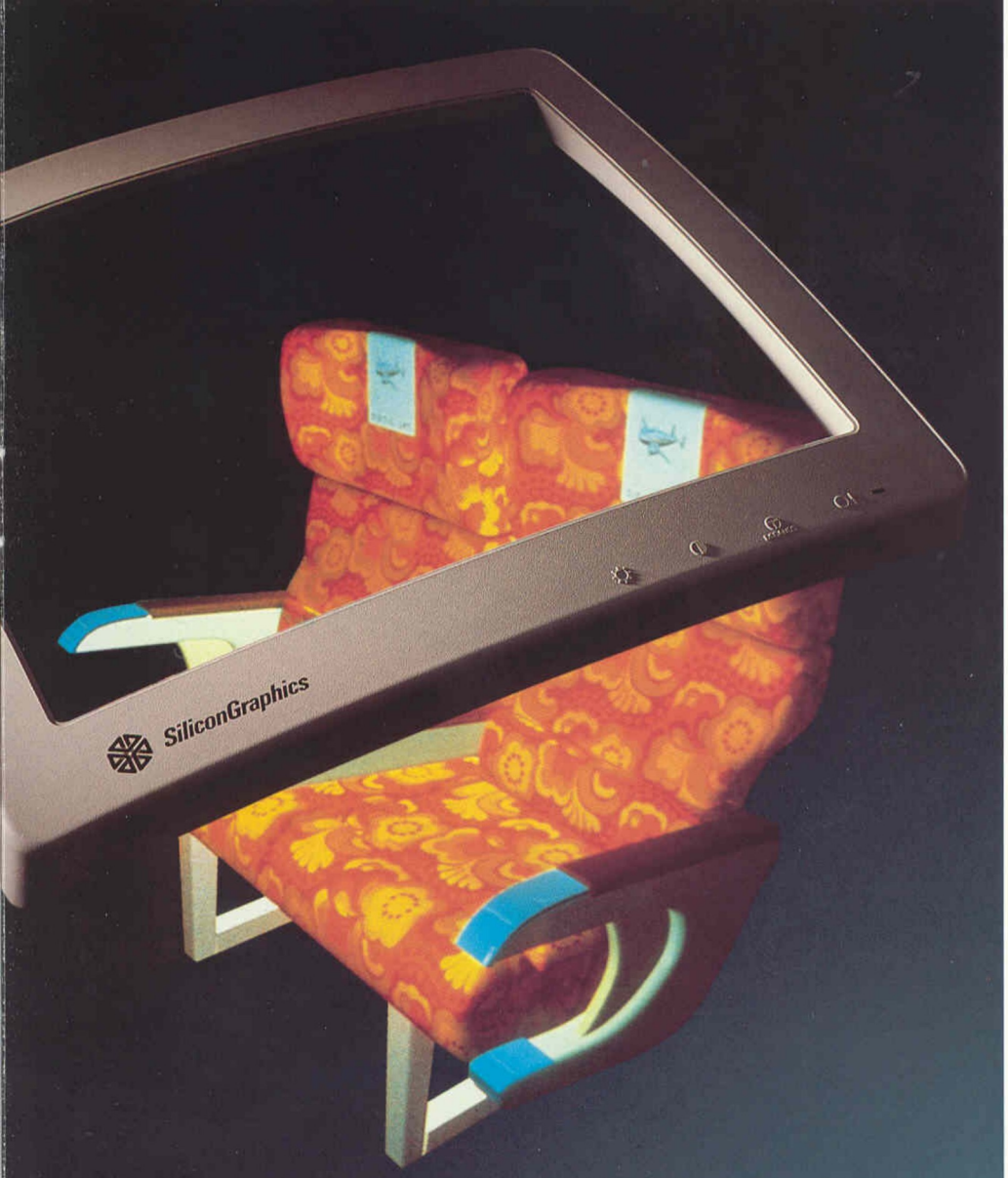
Now, change the desk finish to birch. Or try chrome. Mute the chandeliers with a patina finish. Turn the staircase crimson with richly textured carpets. Make the changes now, see the results now, *before* taking the hours required for your perfect, final software renderings.

Welcome to real-time, creative graphics editing. Welcome to *POWERVISION*. *POWERVISION* changes the ground rules for creative artists and animators by banishing wireframe objects to distant memories. In their stead, *POWERVISION* conjures up images with complex lighting, specularity, smooth edges, textures and transparencies, giving you the power to interactively preview realistic scenes that used to be possible only with software . . . and a lot of time.

You now have a vehicle for powerful client presentations. A platform for working interactively, allowing instantaneous visual experimentation with immediate client feedback.

Anti Aliasing

Apply anti-aliasing to polygons, vectors and points. Smooth out jagged edge artifacts. Through advanced techniques developed at Silicon Graphics, every system primitive can be modeled realistically to provide you with the ultimate in interactive image rendering quality. The *VISION* graphics system was developed with new techniques for polygon anti-aliasing which avoid many of the pitfalls of more traditional methods and provide better overall results. Polygons are properly blended with their neighbors, leaving no visible edges or gaps, and are smoothed along all edges, even against high-contrast or complex backgrounds. Combining the anti-aliasing features with the new video options, you can now record complex realistic graphics free from crawling jaggies, directly to NTSC or PAL equipment in real-time.



Lighting and Scene Composition

Use *POWERVISION*'s new lighting features like spotlights to concoct scenes of headlights and street lamps piercing the London fog, or use the powerful new *SharpScene*™ accumulation buffer to make special effects a snap. Use *SharpScene* to simulate motion blur, depth-of-field, and full scene anti-aliasing, fast and easy, *in the hardware.*

Video interfaces figure prominently, with options that allow you to add Genlock, broadcast quality NTSC, PAL, and Super-VHS output, and real-time video input. With other options, you can double the frame buffer subsystem, adding texture and alpha memory and enabling advanced features like the accumulation buffer and hardware accelerated image processing.

Computer creativity, courtesy of Silicon Graphics.

To see how *POWERVISION* can enable your application to open up new vistas, contact your local Silicon Graphics sales office.

System Specifications

Compute Processors (4D/200 Series)	1-8 25 MHz 32-bit RISC CPUs (MIPS R3000) 1-8 25 MHz floating point coprocessors (MIPS R3010)
Compute Processors (4D/300 Series)	2-8 33 MHz 32-bit RISC CPUs (MIPS R3000) 2-8 33 MHz floating point coprocessors (MIPS R3010)
CPU Memory	Expandable to 256 MB ECC Available in 8 MB increments
CPU Performance	20-234 MIPS 3.3-32.7 double precision MFLOPS
Graphics Processors	4 Geometry Engines, 4 Area Engines, 4 Polygon Engines 5-10 Span Processors, 20-40 Image Memory Processors
Image Memory	All image planes have 1280 x 1024 resolution 48 image bit planes (8 bit red, 8 bit green, 8 bit blue, double buffered) 24 bit planes for Z buffer 24 bit planes for texture storage (8 bit red, 8 bit green, 8 bit blue) 4 bit planes for window updates 4 bit planes for window display 4 bit planes for overlay and underlay (optional) 32 image bit planes (double buffered alpha, texture alpha, stencil) (optional) 64 bit planes for the SharpScene accumulation buffer (16 bit red, 16 bit green, 16 bit blue, 16 bit alpha) (optional) 64 bit planes for additional texture storage
Graphics Performance	1.5 million RGB anti-aliased points/sec. 1 million RGB anti-aliased vectors/sec. (with perspective) 1 million polygons/sec. (3-sided, Z-buffered, lighted, with perspective) 20 million pixels/sec. DMA rate 200 million pixels/sec. pixel fill rate 1.6 billion pixels/sec. screen clear rate (0.78 millisec. screen clear)
Standard Peripherals	Two RS-232C ports per CPU processor for serial communications in addition to ports used for keyboard/mouse 170 or 380 MB 5.25″ Winchester disk drive 101 key up-down encoded keyboard with soft key functions 19″ 60/120 Hz non-interlaced/interlaced multi-sync monitor with tilt and swivel, 3-button optical mouse
Video Interface	RGB and Alpha levels 0.7 Vp-p into 75 ohms 60 Hz non-interlaced refresh rate Interlaced refresh rates available: 30 Hz 1280 x 1024, 30 Hz 636 x 485 (NTSC) 30 Hz 768 x 575 (PAL), 120 Hz 1280 x 492 (Stereoscopic)
Standard Software	UNIX System V.3 operating system with Berkeley 4.3 and Silicon Graphics enhancements C Compiler and development environment IRIS edge visual debugger development environment IRIS Graphics Library 4Sight Window Manager WorkSpace graphical interface to IRIX

Options

Hardware Options	Add-on memory in 8 MB increments Genlock with Broadcast Quality NTSC and PAL encoding StereoView™ stereoscopic glasses and emitter VideoCreator™ VME option for VTR deck control
Peripherals Options	380 and 780 MB SCSI Winchester disk drives 380 and 780 MB ESDI Winchester disk drives 1.2 GB SMD disk drives (supports up to 20 GB) 150 MB ¼″ cartridge tape drives ½″ tape drives Color printer controller 11″ x 11″ digitizer tablet "Spaceball" 6-axis input device Dials and buttons box Programming terminal
Communications Options	RS-232C ports for serial communications (to 19.2K baud) Parallel controller IEEE-488 interface IBM coax 3270 emulation IBM 5080 emulation IBM PC emulation DECnet connectivity DR11W connectivity Hyperchannel connectivity
Software	POWER FORTRAN accelerator FORTRAN compiler Network File System (NFS) Documentor's Workbench EMACS text editor

Physical and Environmental Specifications

Power Requirements	AC voltage: nominal 115V (87-132) AC frequency 47-63 Hz NEMA 5-20 amp outlet Chassis; 1840 VA, 1310 W, 4470 BTU/hr 19″ monitor: 225 VA, 115 W, 512 BTU/hr International and domestic 220V models available
Size and Weight	19″ monitor: 18.5″H x 20″W x 21.5″D (51 x 48 x 54 cm), 84 lb. (38 kg) Chassis: 26″H x 26″W x 27″D (65 x 65 x 68 cm), 185 lb. (84 kg)
Environment	Operating 50-95F (10-35C), 10-80% relative humidity, no condensation Shipping/storage: −40 to 140F (−40 to 60C), 10-90% relative humidity, no condensation

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